

REMARKS

Applicants appreciate the thorough examination of the present application as evidenced by the Office Action of April 20, 2006. In particular, Applicants appreciate the Examiner's indication that Claims 9-12 and 22 would be allowable if rewritten in independent form. *See* Office Action, page 12. Applicants have rewritten Claims 9, 12 and 22 in independent form and, therefore, respectfully submit that these claims and the claims that depend therefrom are in condition for allowance. Applicants also appreciate the Examiner's consideration of Applicants' numerous information disclosure statements. Applicants have amended the specification and claims as set out above and, therefore request withdrawal of the objections thereto. Applicants respectfully submit that the pending claims are in compliance with 35 U.S.C. § 112 for at least the reasons discussed herein. Accordingly, as Claims 25-45 are in compliance with §112 and no further rejections remain with respect to these claims, Applicants submit that Claims 25-45 are in condition for allowance. Finally, Applicants have amended Claim 1 as set out above and respectfully submit that Claims 1 and 63 and the claims that depend therefrom are in condition for allowance, which is respectfully requested in due course.

Objections to the Specification

The Office Action objects to typographical errors in the specification. *See* Office Action, page 2. Applicants have amended the specification as set out above and, therefore, respectfully request that the objections with respect to the specification be withdrawn as obviated.

Objections to the Claims

Claim 36 stands objected to under 37 C.F.R. § 1.75 as being a substantial duplicate of Claim 17. *See* Office Action page 2. Applicants have amended Claim 36 to depend from Claim 25 instead of Claim 18 and, therefore, respectfully request that the objection with respect to Claim 36 be withdrawn as obviated. Furthermore, Applicants have amended Claim 37 to depend from Claim 36 to provide antecedent basis for the elements claimed therein.

Claim 43 and 79 stands objected as including various typographical errors. *See* Office Action page 3. Applicants have amended Claims 43 and 79 as set out above and, therefore,

respectfully request that the objections with respect to Claims 43 and 79 be withdrawn as obviated.

The Section 112 Rejections

Claims 1-45 and 75 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. *See* Office Action, page 3.

In particular, the Office Action states that the term "low temperature" in Claim 1 "is indefinite in scope and meaning as to how low of a temperature is considered as 'low'". *See* Office Action, page 3. Applicants respectfully submit that this term is not indefinite as it is defined in the specification. In particular, the specification of the present application states:

In particular, a low temperature deposition process may be used. As used herein "low temperature deposition" refers to formation of a layer at a temperature lower than a temperature at which substantial mass transport from the wafer to the regrown region takes place. For example, the contact layer 26' may be formed at a temperature of from about room temperature to about 950 °C. In some embodiments, the contact layer 26' is formed at a temperature of less than 960 °C. In particular embodiments of the present invention, the contact layer 26' is formed at a very low temperature, for example, at a temperature of less than about 450 °C and in some embodiments, at temperature of less than about 200 °C. Such very low temperature conditions may be used, for example, with sputtering and/or PECVD growth techniques. The use of a reduced deposition temperature and/or low temperature deposition may reduce trapping and/or may provide improved reliability.

See Specification, page 13, lines 23-34 (emphasis added). Thus, the term "low temperature deposition" is defined and several examples of temperatures are given in the specification of the present application. Accordingly, Applicants respectfully request that the §112 rejections with respect to Claim 1 be withdrawn for at least these reasons.

The Office Action further states that the claim term "n-type contact layer" in Claims 19-22 lacks antecedent basis. *See* Office Action, page 3. As set out above, Applicants have amended Claim 19-22 to recite a "contact layer." Accordingly, Applicants respectfully submit that the §112 rejections with respect to Claims 19-22 be withdrawn as obviated for at least these reasons.

The Office Action further states with respect to Claim 25 that "it is unclear how a 'nitride-based' contact region is formed by selectively removing the masking layer and a portion of the contact layer." *See* Office Action, page 4. As set out above, Applicants have

amended Claim 25 to recite a "nitride based contact layer" instead of a "contact layer." Accordingly, Applicants respectfully request withdrawal of the §112 rejection with respect to Claim 25 as obviated for at least these reasons. Applicants have also amended Claims 34-35, 36, 38-40 and 43-45 to recite a "nitride based contact layer" instead of a "contact layer" to conform to the amendment of Claim 25.

The Office Action further states that the term "the oxide layer" in Claim 34 lacks antecedent basis. *See* Office Action, page 4. As set out above, Applicants have amended Claim 34 to recite "the masking layer" instead of the "oxide layer" and, therefore, respectfully request that the §112 rejection with respect to Claim 34 be withdrawn as obviated for at least these reasons.

The Office Action further states that limitations of Claim 37 lack antecedent basis. *See* Office Action, page 4. As set out above, Applicants have amended Claim 37 to depend from Claim 36 and, therefore, respectfully request that the §112 rejection with respect to Claim 34 be withdrawn as obviated for at least these reasons.

The Office Action further states that the term "the contact recess" in Claim 45 lacks antecedent basis. *See* Office Action, page 4. As set out above, Applicants have amended Claim 45 to recite "further comprising a contact recess that extends..." and, therefore, respectfully request that the §112 rejection with respect to Claim 45 be withdrawn as obviated for at least these reasons.

Finally, the Office Action states that the term "low temperature" in Claim 75 is indefinite in scope and meaning as to how low of a temperature is considered as "low." *See* Office Action, page 4. As discussed above with respect to Claim 1, the term "low temperature deposition" is defined and several examples of temperatures are given in the specification of the present application. Accordingly, Applicants respectfully request that the §112 rejections with respect to Claim 75 be withdrawn for at least these reasons.

Accordingly, for at least the reasons discussed above, Applicants respectfully submit that Claims 1, 19-22, 25, 34, 37, 45 and 75 and the claims that depend therefrom are in compliance with 35 U.S.C. §112.

Furthermore, since no further rejections remain with respect to Claims 25-45, Applicants respectfully submit that Claims 25-45 are in condition for allowance. Applicants further submit that dependent Claims 14 and 68 contain allowable subject matter, as no rejections remain with respect to these dependent claims.

The Section 102 Rejections

Claims 1, 7, 8, 13, 16-21, 23, 24, 63-67, 71, 72, 74-76, 79 and 80 stand rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent No. 6,534,801 to Yoshida *et al.* (hereinafter "Yoshida"). *See* Office Action, page 4. Applicants respectfully submit that many of the recitations of these claims are neither disclosed nor suggested by the cited reference. For example, amended Claim 1 recites:

A method of fabricating a transistor, comprising:
forming a nitride-based channel layer on a substrate;
forming a barrier layer on the nitride-based channel layer;
forming a contact recess in the barrier layer to expose a contact region of the nitride-based channel layer;
forming a contact layer on the exposed contact region of the nitride-based channel layer using a low temperature deposition process, such that the contact layer does not extend beneath the barrier layer;
forming an ohmic contact on the contact layer; and
forming a gate contact disposed on the barrier layer adjacent the ohmic contact.

Applicants respectfully submit that at least the highlighted portions of amended independent Claim 1 are neither disclosed nor suggested by the cited reference for at least the reasons discussed herein.

As a preliminary note, under 35 U.S.C. § 102, "a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." M.P.E.P. § 2131 (quoting *Verdegaal Bros. v. Union Oil Co.*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987)). There must be no difference between the claimed invention and the disclosure of the cited reference as viewed by one of ordinary skill in the art. *See Scripps Clinic & Research Foundation v. Genentech Inc.*, 18 U.S.P.Q.2d 1001 (Fed. Cir. 1991). In particular, the Court of Appeals for the Federal Circuit held that a finding of anticipation requires absolute identity for each and every element set forth in the claimed invention. *See Trintec Indus. Inc. v. Top-U.S.A. Corp.*, 63 U.S.P.Q.2d 1597 (Fed. Cir. 2002). Thus, even before Claim 1 was amended as set out above, Yoshida failed to anticipate the recitations thereof as nothing in Yoshida discloses or suggests forming a contact layer ... using a low temperature deposition process as recited in original Claim 1. In fact, nothing in Yoshida even discusses a temperature with respect to formation of the n-type GaN layer 5 of Yoshida, which the Office Action points to as providing the teachings of

the contact layer as recited in Claim 1. *See* Office Action, page 4. Accordingly, Applicants respectfully submit that Yoshida, on its face, does not even anticipate the recitations of Claim 1 before Claim 1 was amended for at least the reasons discussed herein. However, Applicants have amended Claim 1 as set out above to further clarify the differences between Yoshida and the claims of the present application.

The Office Action points to the undoped AlGaN layer 4 of Yoshida as teaching the barrier layer as recited in Claim 1 and the n-type GaN layer 5 of Yoshida as teaching the contact layer as recited in Claim 1. *See* Office Action, pages 4-5. As illustrated in Figure 1 of Yoshida, a portion of the n-type GaN layer 5 extends beneath the undoped AlGaN layer 4. As stated in Yoshida:

The undercut portion 4a is provided so that a good electric conduction can be obtained between the two-dimensional electron gas layer, which is generated at the junction interface between the undoped GaN layer 3 and the undoped AlGaN layer 4, and the n-type GaN layer 5.

See Yoshida, column 4, lines 16-21. Thus, the portion of the n-type GaN layer 5 that extends beneath the undoped AlGaN layer 4 is a necessary aspect of Yoshida.

In stark contrast, amended Claim 1 recites "the contact layer does not extend beneath the barrier layer." This aspect of the present invention is clearly illustrated in the Figures of the present application. For example, Figure 1E illustrates the contact layer 26' extending to a sidewall of the barrier layer 22, but not beneath the barrier layer 22. Nothing in Yoshida discloses or suggests the contact layer not extending beneath the barrier layer as recited in amended Claim 1. In fact, Yoshida teaches the opposite, Yoshida clearly illustrates, for example, in Figure 1, the n-type GaN layer 5 extending beneath the undoped AlGaN layer 4 and discusses why this aspect of Yoshida is important.

Applicants respectfully submit that amended Claim 1 and the claims that depend therefrom are in condition for allowance for at least the reasons discussed herein.

Accordingly, Applicants respectfully request allowance of these claims in due course.

The Office Action further states that independent Claim 63 and the claims that depend therefrom are anticipated by Yoshida. *See* Office Action, pages 6-7. Applicants respectfully submit that many of the recitations of these claims are neither disclosed nor suggested by Yoshida. For example, Claim 63 recites:

A method of fabricating a high electron mobility transistor, comprising:
forming a nitride-based channel layer on a substrate;

forming a barrier layer on the nitride-based channel layer;
forming at least one contact recess in the barrier layer that extends into the channel layer;
forming a contact region on the nitride-based channel layer in the contact recess;
forming a gate contact disposed on the barrier layer; and
wherein forming the contact region and forming the nitride-based channel layer include forming the contact region and forming the nitride-based channel layer to include a surface area enlargement structure.

Applicants respectfully submit that at least the highlighted recitations of independent Claim 63 are neither disclosed nor suggested by Yoshida for at least the reasons discussed herein.

The Office Action points to undercut portions 4a of Yoshida as teaching the highlighted recitations of independent Claim 63. *See* Office Action, pages 6-7. As a preliminary note, the Office Action points to the undercut portions 4a as teaching the contact recess as recited in Claim 1 (*See* Office Action, page 4) and now points to the undercut portions 4a as teaching the surface enlargement structure as recited in Claim 63. *See* Office Action, pages 6-7. It cannot be both. Furthermore, as discussed above, the undercut portions 4a of Yoshida are provided so "that a good electric conduction can be obtained between the two-dimensional electron gas layer." *See* Yoshida, column 4, lines 16-17. Nothing in Yoshida discusses the use of the undercut portions 4a as a surface area enlargement structure. In fact, nothing in Yoshida even mentions surface area enlargement. As discussed above, anticipation requires that each and every element of a claim be taught by a single reference. Yoshida, on its face, clearly does not anticipate Claim 63 for at least the reasons discussed herein.

Applicants respectfully submit that Claim 63 and the claims that depend therefrom are patentable over Yoshida for at least the reasons discussed herein. Accordingly, Applicants respectfully request allowance of these claims in due course.

As discussed above, the dependent claims are patentable over the cited references at least per the patentability of the independent base claims from which they depend. Many of the dependent claims are also separately patentable.

For example, Claim 8 recites

The method of Claim 1, wherein the low temperature deposition process is a process other than mass transport from a wafer on which the transistor is formed.

As discussed above, nothing in Yoshida discusses a temperature with respect to the formation of the n-type GaN layer 5, therefore, it follows that nothing in Yoshida discusses the details of the low temperature deposition process as recited in Claim 8. Accordingly, Applicants respectfully submit that Claim 8 is separately patentable over Yoshida for at least these additional reasons.

Claim 19 recites:

The method of Claim 1, further comprising forming sidewalls of the channel layer to provide an increased surface area interface between the channel layer and the contact layer as compared to a planar interface.

The Office Action just states that the teachings of Claim 19 are expressly disclosed in Figure 4 of Yoshida. *See* Office Action, page 6. Applicants disagree. Nothing in Yoshida discloses or suggests "forming sidewalls of the channel layer to provide an increased surface area interface between the channel layer and the contact layer as compared to a planar interface" as recited in Claim 19. Accordingly, Applicants respectfully submit that Claim 19 is separately patentable over Yoshida for at least these additional reasons.

Claim 64 recites:

The method of Claim 63, wherein forming the contact region and forming the nitride-based channel layer include forming the contact region and forming the nitride-based channel layer to include a surface area enlargement structure comprises patterning sidewalls of portions of the contact recess that extend into the channel layer.

As discussed above, nothing in Yoshida discusses a surface area enlargement structure, therefore, it follows that nothing in Yoshida discusses the details of the surface area enlargement structure as recited in Claim 64. Accordingly, Applicants respectfully submit that Claim 64 is separately patentable over Yoshida for at least these additional reasons.

The Section 103 Rejections of the Dependent Claims

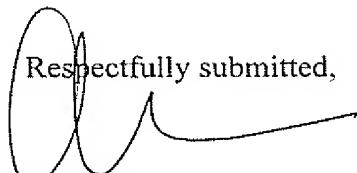
Claims 5, 6, 15, 77 and 78 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of United States Patent No. 5,701,019 to Matsumoto *et al.* *See* Office Action, page 9. Claims 2-4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of United States Patent No. 6,533,874 to Vaudo *et al.* *See* Office Action, page 11. Claims 73 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of United States Patent No. 5,698,870 to Nakano *et al.*

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*See Office Action, page 11. Claims 69 and 70 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida in view of United States Patent No. 6,727,531 to Redwing *et al.* See Office Action, page 12. As discussed above, the dependent claims are patentable at least per the patentability of the independent base claims from which they depend.* Accordingly, Applicants respectfully submit that dependent Claims 2-5, 6, 15, 69-70, 73, 77 and 78 are patentable over the cited references for at least the reasons discussed herein.

CONCLUSION

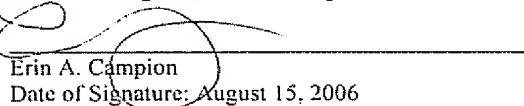
Applicants respectfully submit that the pending claims are patentable over the cited reference for at least the reasons stated herein. Accordingly, Applicants submit that the pending claims are in condition for allowance, which is respectfully requested in due course. If, in the opinion of the Examiner, a telephonic conference would expedite the examination of this matter, the Examiner is invited to call the undersigned attorney at (919) 854-1400.


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Date of Signature: August 15, 2006